DOCUMENT RESUME

ED 046 986 TM 000 347

TITLE	Research into the Correlates of School Performance--A Review and Summary of Literature.
INSTITUTION	Michigan State Dept. of Education, Lansing.
REPORT NO	AR-No-3
PUB DATE	70
NOTE	28p.; Paper presented at the Annual Meeting of the American Educational Research Association, New York, New York, February 1971
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	Academic Performance, Educational Environment, Educational Finance, *Educational Objectives, Educational Quality, *Educational Research, Equal Education, Financial Support, *Input Output Analysis, *Performance Factors, Predictor Variables, Research Problems, *Research Reviews (Publications), Socioeconomic Influences
IDENTIFIERS	*Michigan Assessment Program

ABSTRACT

Current attempts to identify and quantify different variables relating to school performance are surveyed. The "input-process-output" model is examined through an overview of major studies, such as Project Talent and the Coleman Report, and others generally supportive of this approach. The limitations of this research are suggested as: inadequacy of the definition and measurement of the concept of school performance; inadequate definition and measurement of the correlates of school performance; inadequate statistical methods; scarcity of school-by-school data; lack of longitudinal data; and lack of integration of research resources. The report concludes that the paradigm has aided in the understanding of four things about our formal school processes: (1) they are fundamentally influenced by the children who participate in them and the environment in which they operate; (2) they are additionally influenced by the levels at which they are supported; (3) the effects of resources are largely mediated through the professional staff; and (4) they operate in complex, interrelated, and arcane fashion. A bibliography is included. See TM 000 324, TM 000 345-6, and TM 000 348-9. (AE)

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RESEARCH INTO

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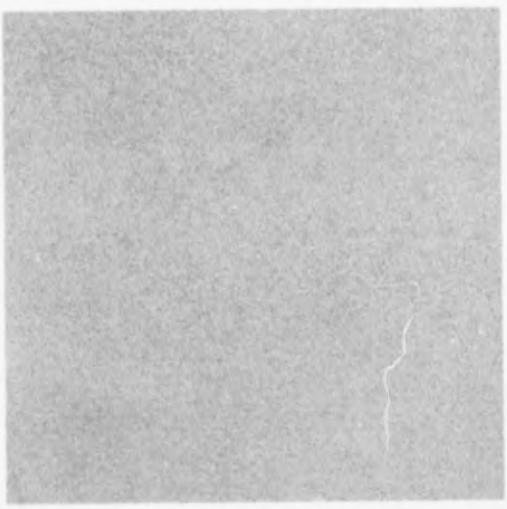
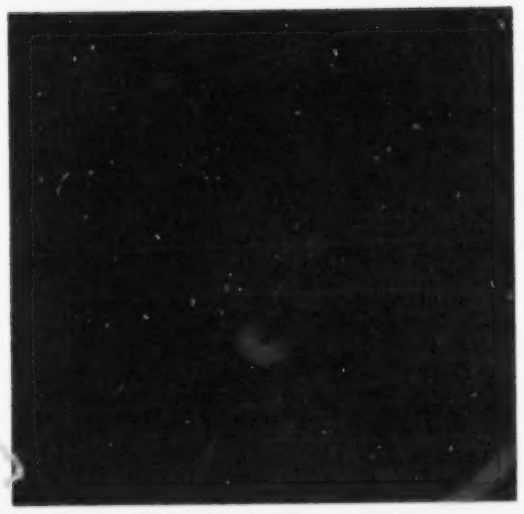
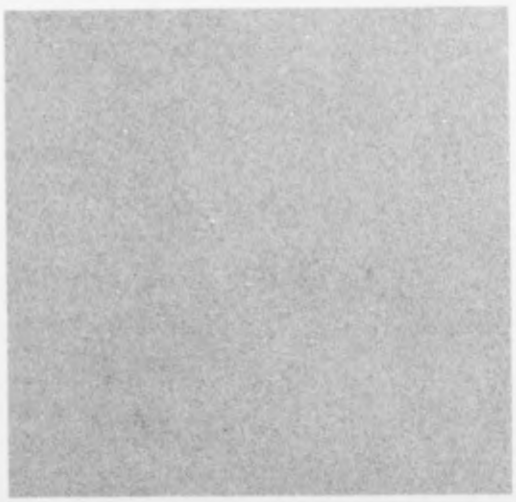
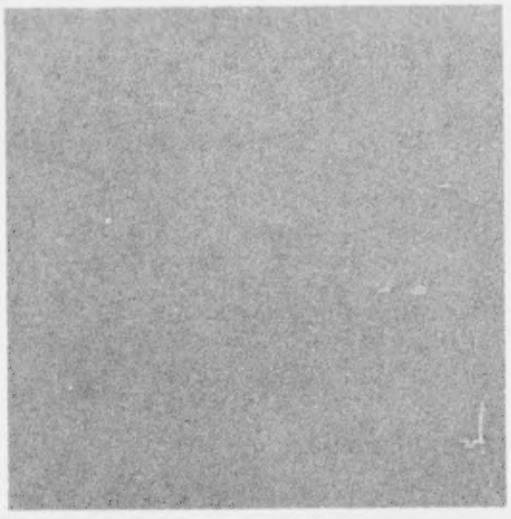
A REVIEW AND SUMMARY OF LITERATURE









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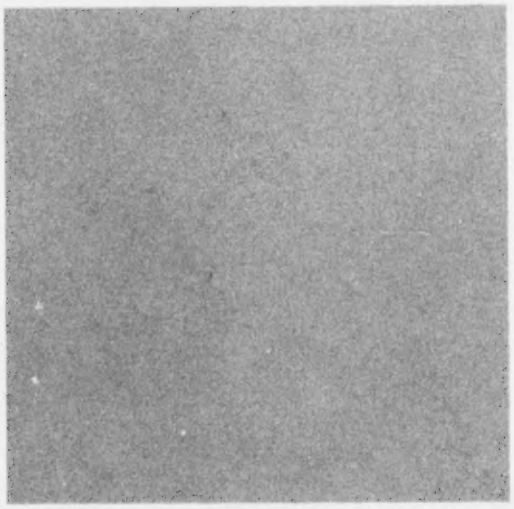

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FOREWORD

The Michigan Department of Education is pleased to present Research into the Correlates of School Performance: A Review and Summary of Literature. This monograph is the third in a series of reports prepared as part of the Michigan Assessment Program. It is the purpose of the monograph to review research into the question "What factors are related to student performance in schools?" This review has been very important for it has helped identify a number of variables to be measured in the Michigan Assessment Program in addition to student performance. In the 1969-70 Program these variables have been of four types: student socio-economic status, student attitudes and aspirations, school human (or instructional staff) resources, and school financial resources. Thus the Michigan Assessment Program examines the level and distribution of student performance--as measured by a basic skills achievement battery--and a number of other variables presumed to be related to student performance.

Research into the Correlates of School Performance was prepared by Dr. Thomas P. Wilbur, Acting Deputy Associate Superintendnet, Bureau of Research, Evaluation and Assessment. Comments or questions regarding it should be addressed directly to him.

John W. Porter
Acting Superintendent of
Public Instruction

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RESEARCH INTO THE CORRELATES OF SCHOOL PERFORMANCE: A REVIEW AND SUMMARY OF LITERATURE

INTRODUCTION

Researchers interested in understanding and improving education have long sought the causes of variation in school performance. This monograph describes one area of their work: that which has identified, quantified, and related the many variables that make up the educational "system." Employing a conceptual input-process-output model similar to the one presented in Figure I, this research has related input variables such as pupil background and school resources to process variables and, more often, to output or school performance variables such as average student achievement. More specifically, researchers employing this paradigm have: (1) identified a criterion of school performance as a dependent variable, and measures thought to influence performance as independent variables; (2) operationally measured these variables in a sample of educational systems; (3) computed relationships between independent and dependent variables; and (4) drawn inferences from the relationships as to what factors, either singly or in combination, account for variation in school performance.

This research paradigm has become increasingly popular in recent years because of intensified interest in determining the factors that influence what children learn in schools and because of the improved data-handling and computational capabilities of computers. This monograph will: (1) review several major research efforts of the type described above; (2) discuss the limitations of this research; and (3) outline four major conclusions we may draw regarding our schools as a result of the research under discussion.

A REVIEW OF MAJOR RESEARCH EFFORTS

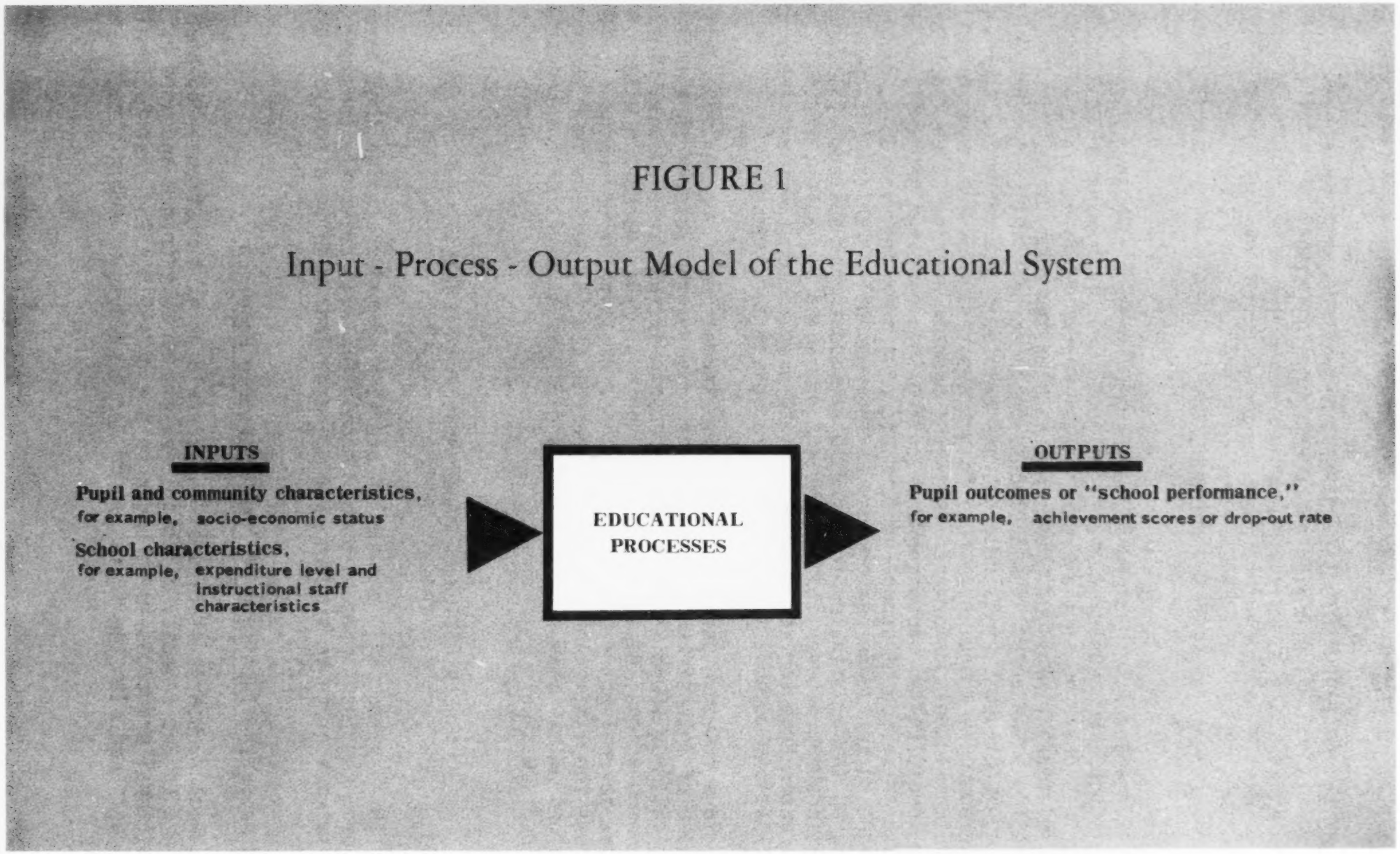
This section will provide an overview of major studies that have employed the input-process-output model. It will primarily consider the conclusions of those studies; their limitations will be discussed later.

Studies in the Institute of Administrative Research

Paul R. Mort's studies of the correlates of educational "adaptability"--defined as the capacity of school systems to take on new and more effective educational practices--were begun in the mid-1930's and institutionalized and continued with the formation of the Institute of Administrative Research

FIGURE 1

Input - Process - Output Model of the Educational System



at Teachers College, Columbia University in the early 1940's. The Institute's work has centered around data obtained from three organizations of school systems affiliated with it: The Metropolitan School Study Council, presently a group of some sixty high-expenditure suburban New York City school systems; The Associated Public School Systems, a group of several hundred school systems located throughout the country; and the Central School Study, composed of some five-hundred of New York State's "central" or consolidated school systems.

The vast number of studies--over two-hundred doctoral dissertations, several books, and a number of monographs--makes the Institute's work extremely difficult to summarize.[1] For the purposes of this review, however, we may note three things about it. First, a number of definitions of educational performance or "school quality" have been employed in the Institute. From the mid-1930's to the mid-1950's, it was "adaptability;" since then a number of criteria including "holding power" (or drop-out rate), and "student achievement;" and, recently a measure of the goodness of the school's process, entitled "Indicators of Quality" have been employed (this measure is described below).

Second, a number of conceptualizations of the educational system have been employed in the Institute. Perhaps the best-known early model was the "Quality Control Profile." At the center of this conceptualization was the schools' "program." Influencing it were variables of three basic types: staff characteristics, financial potential and spending policy of the school system, and community characteristics.[2] More recently, as development of "Indicators of Quality" has progressed under the Institute's present director, William S. Vincent, an input-process-output model of the educational system has been developed.[3]

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[1]See, for example: Donald H. Ross, Administration for Adaptability (New York: Metropolitan School Study Council, 1958); William S. Vincent, "Quality Control: A Rationale for Analysis of a School System," IAR Research Bulletin, I (January, 1961), 1-7; Paul R. Mort, "Studies in Educational Innovation from the Institute of Administrative Research: An Overview," IAR Research Bulletin, III (October, 1962), 1-8; William S. Vincent, "Measuring School Quality: Output and Process," IAR Research Bulletin, IV (May, 1964) 1-5; and William S. Vincent, "Measuring School Quality: Inputs and Criteria," IAR Research Bulletin, VI (November, 1965), 1-5.

[2]Vincent, "Quality Control: A Rationale for Analysis of a School System," op. cit.

[3]William S. Vincent, "Indicators of Quality," IAR Research Bulletin, VII (May, 1967), 2.

Third, although the Institute's chief dependent variable, adaptability, has been much criticized we may note that in a number of studies three classes of variables have been shown to be related to it: community characteristics, expenditure level, and staff characteristics. Not enough work has yet been done in relating school and non-school variables to the process variable "Indicators of Quality," to discuss its correlates.

Project Talent

Project Talent is a massive research effort involving 400,000 high school students from a representative sample of 1,353 of the nation's high schools. Operated by the American Institute for Research, the project is aimed at studying "American high schools in all of their diversity."[4] Among the Project Talent purposes has been that of seeking the correlates of a number of pupil outcomes. After a study of several sub-samples of high schools Flanagan and others wrote:

> The Project Talent data to date indicate that four of the most important treatment factors closely and uniquely associated with school outcomes such as achievement and going on to college and staying in school are:
>
> a. Teacher salaries
> b. Teacher experience
> c. Number of books in the school library
> d. Per-pupil expenditure
>
> These four factors remain important even after region, rural-urban status, and such socio-economic factors as median family income and quality of housing are held constant.[5]

Flanagan further stated that other factors--including school size, average size of classes, age of building, and suburban location--were not likely to be associated with school performance once region, rural-urban status, and socio-economic factors were held constant.[6]

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[4]John C. Flanagan and others, A Survey and Follow-up Study of Educational Plans and Decisions in Relation to Aptitude Patterns: Studies of the American High School (Pittsburgh: University of Pittsburgh, 1962), 1-8. For further analysis of the TALENT data see: Marion F. Shaycoft, The High School Years: Growth in Cognitive Skills (Pittsburgh: University of Pittsburgh, 1967).

[5]Ibid., 10-11.

[6]Ibid.

The California Study

A study of the correlates of educational achievement in California was conducted by Charles S. Benson and others for a (California) Senate committee in 1963-65. Benson's sample included 249 elementary and unified districts in the State's seventeen most-heavily populated areas which gave achievement tests to their fifth graders in 1962. The study related some thirty-four school and non-school variables.[7]

The second through seventh of Benson's conclusions are of interest to this review:

> (2) The home environment of children is strongly related to their performance on both achievement and I.Q. tests.
>
> (3) Yet, there does appear to be a set of significant relations between quality of educational provision in school districts and the performance of pupils.
>
> (4) We are led to the conclusion that caliber of teachers is the single most important factor.
>
> (5) For some types of districts other factors, such as class size and administrative staffing, also appear to be relatively important.
>
> (6) In general, in the districts where the income level of citizens (and the educational level as well) is high, schools are more generously provided with resources than they are in districts where the level of household income is low.
>
> (7) Thus, it would appear that districts wherein a large proportion of children enter school with environmental advantages are the districts best provided with school resources and that districts in which a relatively large proportion of children enter school under environmental handicaps are least well provided with the means through which these handicaps could be overcome.[8]

Input and Output in Large-City High Schools

This report, by Jesse Burkhead, Thomas G. Fox, and John W. Holland, examined high school student performance and its correlates in Chicago and Atlanta. Output measures in the two studies included intelligence and verbal

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[7]Charles S. Benson, State and Local Fiscal Relationships in Public Education in California (Sacramento: Senate of the State of California, 1965), 41-42.

[8]Ibid., 58.

reading test scores, the schools' holding power rates, and post-high school measures. A large number of school and non-school input variables were employed.

The most important conclusions of the Chicago study were:

(1) The socio-economic variables are of the greatest importance in determining differences in school outputs. The out-of-school variables are far more significant than the in-school variables.

(2) The small variations that exist among inputs and process variables in Chicago high schools and the absence of a random distribution where variations do exist are not sufficient to reveal systematic differences in response or at least not a uniform response over the whole range of school outputs. Neither class size nor teacher man-years per student is important in producing different educational outcomes within the range of variation that exists in Chicago.

(3) Some inputs are important for some outputs but not for others. Newer buildings do reduce school dropouts, but newer buildings have no influence on 11th-grade scores.

(4) The experience of the teacher is important, particularly in its impact on reading scores. This is generally a more important determinant of outcomes than class size or the formal education of the teacher.

(5) The size of the high school, again within the range of Chicago school size, is not uniformly important as an educational variable.[9]

The most important conclusions of the Atlanta study were:

(1) The major determinants of school performance in Atlanta are factors external to the school itself, such as family income and family housing conditions.

(2) Current expenditures as such have very little influence on school outputs.

(3) Dropouts are a predictable phenomenon in Atlanta. The high positive association of current expenditures and dropout rates would suggest that simply allocating more resources will not help this problem.

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[9]Jesse Burkhead, Thomas G. Fox, and John W. Holland, Input and Output in Large-City High Schools (Syracuse: Syracuse University Press, 1967), 56.

(4) The ratio of faculty to students is of some importance in explaining 10th-grade verbal scores.

(5) Faculty salaries, the proxy for teacher experience and high degrees, is associated with higher verbal scores, although not to an extent that is statistically significant.

(6) Teacher turnover would appear to be important when one looks at the value added by the school to verbal scores.[10]

Equality of Educational Opportunity

The best known--and most controversial--of the research reports using the paradigm described above is Equality of Educational Opportunity, written by James S. Coleman[11] and others for the U.S. Office of Education. This massive survey included data from some 600,000 students in 5,000 schools.

Because of the importance of the Coleman survey, its conclusions regarding the correlates of achievement are here stated in their entirety:

Of the many implications of this study of school effects on achievement, one appears to be of overriding importance. This is the implication that stems from the following results taken together:

(1) The great importance of family background for achievement;

(2) The fact that the relation of family background to achievement does not dimish over the years of school;

(3) The relatively small amount of school-to-school variation that is not accounted for by differences in family background, indicating the small independent effect of variations in school facilities, curriculum, and staff upon achievement;

(4) The small amount of variance in achievement explicitly accounted for by variations in facilities and curriculum;

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[10] Ibid., 72.

[11] James S. Coleman and others, Equality of Educational Opportunity (Washington, D.C.: U.S. Government Printing Office, 1966).

(5) Given the fact that no school factors account for much variation in achievement, teachers' characteristics account for more than any other taken together with the results, from section 2.3, which show that teachers tend to be socially and racially similar to the students they teach;

(6) The fact that the social composition of the student body is more highly related to achievement, independently of the student's own social background, than is any school factor;

(7) The fact that attitudes such as a sense of control of the environment, or a belief in the responsiveness of the environment, are extremely highly related to achievement, but appear to be little influenced by variations in school characteristics.

Taking all these results together, one implication stands out above all: That schools bring little influence to bear on a child's achievement that is independent of his background and general social context; and that this very lack of an independent effect means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school. For equality of educational opportunity through the schools must imply a strong effect of schools that is independent of the child's immediate social environment and that strong independent effect is not present in American schools.[12]

The Coleman survey has been widely criticized, particularly because of its statistical methodologies which over-emphasized the importance of non-school variables to achievement. This limitation is discussed below. A number of re-analyses of the Coleman data have been made, however, and we present here the conclusions of one re-analysis, that of Mayeske and others:

> Regression analyses of the student body's Achievement Levels, Expectations, Attitude Toward Life, Educational Plans and Study Habits, against student body and school variables showed that the student body variables made a greater relative contribution than the school variables. The school variables were found to be highly correlated with the student body variables of Socio-Economic Status and Racial-Ethnic composition as well as with school Achievement. Analyses of the overlap of the student body and school variables showed that almost all of the predictable variance in Achievement was contained in the student body-school overlap. Consequently when the schools are equated for the kinds of students that they get initially they tend also to be equated for the influence that they have on these students. However,

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[12] Ibid., 325.

when schools were equated for differences in their size, and the home background and racial composition of the student body through partial correlation techniques, such variables as: pupil teacher ratio; specialized staff and services; teachers' turnover, experience, salary, race, class size and verbal facility continued to show low to moderate relationships with Achievement.

More detailed analyses showed that for Achievement, the student body variables had their greatest overlap with the school personnel and personnel expenditure variables. This suggests that this latter set of variables may be most important in promoting Achievement.

Regional analyses were conducted of the regression of Achievement and attitude indices on student body variables. Considerable regional differences in the dependence of school Achievement on student body home background and Racial-Ethnic composition were discerned. For schools where the dependence of Achievement on the Socio-Economic Status of the students was lowest the school variables made a greater contribution to Achievement than did the student body variables. This highlights not only the importance of Socio-Economic Status in studying school Achievement but suggests that the school variables that contribute to Achievement may differ for students from different socio-economic backgrounds.[13]

Mayeske and others suggest, in short, that school variables are more highly related to achievement than Coleman admitted and that school and non-school variables are very closely related.

Other Studies

A number of other studies have sought the relationship of school and non-school factors to school performance. Mollenkopf and Melville[14] related socio-economic characteristics of students and parents and quality of school services to aptitude and achievement scores of ninth and twelfth

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[13]George W. Mayeske and others, "Correlational and Regression Analyses of Differences Between the Achievement Levels of Ninth Grade Schools From the Educational Opportunities Survey" (Washington, D.C.: National Center for Educational Statistics, 1968), 54-55. (Mimeographed.)

[14]William G. Mollenkopf and S. Donald Melville, "A Study of Secondary School Characteristics as Related to Test Scores" (Princeton, N.J.: Educational Testing Service, 1956). (Mimeographed.)

graders; Goodman[15] employed data from 102 school systems that participated in New York's "Quality Measurement Project" to predict student achievement; Husen[16] and others investigated the correlates of mathematics achievement in twelve countries; Katzman[17] investigated measures associated with pupil performance in fifty-six Boston elementary schools; Raymond[18] sought the determinants of variables representing adequacy of preparation for college in West Virginia; Cohn[19] related achievement scores in 377 Iowa districts to school services; and Guthrie and others[20] reanalyzed data from the Coleman Report in a sample of Michigan schools.

There have also been a number of recent doctoral dissertations which have employed the model under discussion. Thomas[21] employed a multiple regression model to examine data from some 200 Project TALENT high schools; Kiesling[22] reanalyzed data from New York's "Quality Measurement Project;"

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[15]Samuel M. Goodman, The Assessment of School Quality (Albany, N.Y.: New York Department of Education, 1959).

[16]Torsten Husen and others (eds.), International Study of Achievement in Mathematics: A Comparison of Twelve Countries, 2 vols. (New York: John Wiley and Sons, 1967).

[17]Theodore M. Katzman, "Distribution and Production in a Big City Elementary School System," Yale Economic Essays, VIII (Spring, 1968), 201-256.

[18]Richard Raymond, "Determinants of the Quality of Primary and Secondary Public Education in West Virginia," The Journal of Human Resources, III (Winter, 1968), 450-470; and Richard D. Raymond, "The Quality of Primary and Secondary Public Education in West Virginia" (Morgantown, West Virginia: Regional Research Institute and Human Resources Institute, West Virginia University, 1967). (Mimeographed.)

[19]Elchanan Cohn, "Economies of Scale in Iowa High School Operations, Journal of Human Resources, III (Fall, 1968), 422-434.

[20]James W. Guthrie and others, Schools and Inequality: A Study of Social Status, School Services, Student Performance, and Post-School Opportunity in Michigan (No publication place: The Urban Coalition, 1969).

[21]J. Alan Thomas, "Efficiency in Education: A Study of the Relationship Between Selected Inputs and Mean Test Scores in a Sample of Senior High Schools" (Unpublished Ph.D. dissertation, Stanford University, 1962). See also: J. Alan Thomas, "Efficiency in Education: An Empirical Study," Administrator's Notebook, XI (October, 1962), 1-4.

[22]Herbert J. Kiesling, "Measuring a Local Government Service: A Study of Efficiency of School Districts in New York State" (Unpublished Ph.D. dissertation, Harvard University, 1965).

Martin[23] studied the relationship of selected variables in Kentucky school systems to several school performance measures; Hanushek[24] studied correlates of achievement in schools attended by Negroes and whites using Coleman Report data; and Laabs[25] examined the correlates of drop-out rate in a sample of schools affiliated with the Institute of Administrative Research.

These studies are generally supportive of the research cited above and of the conclusions regarding our schools that are made in this monograph.

LIMITATIONS OF THE STUDIES UNDER REVIEW

Several of the studies reviewed above have been criticized for their inadequacies of design, methodology, and conclusions. This section reviews major problems and limits of those studies.

Definition of "School Performance"

Perhaps the fundamental problem facing those searching for the correlates of school performance is that of adequately defining the term. Mort's early studies relied on an *a priori* definition of school quality, "adaptability," which was defined as the capability of educational systems to take on new and more effective practices. Although adaptability was a relatively easy concept to measure it lacked theoretical elegance as a school quality variable. It was not, in fact, a measure of school performance or quality at all; more accurately, it was a measure of institutional vitality.

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[23]Charles Franklin Martin, "The Kentucky Quality Education Study: An Analysis of the Relationships Between Certain Criteria of Quality Education and Socio-Economic, Cultural and Educational Dimensions of Local Communities of Kentucky" (Unpublished Ed.D. dissertation, The University of Kentucky, 1968). See also: Willaim J. Diamond, Charles F. Martin, and Richard I. Miller, "Methodology for Assessing the Quality of Public Education," *Bulletin of the Bureau of School Service*, XLI (March, 1969), 1-82.

[24]Eric A. Hanushek, "The Education of Negroes and Whites" (Unpublished Ph.D. dissertation, Massachusetts Institute of Technology, 1968).

[25]Charles W. Laabs, "An Examination of Relationships Between Certain School Variables and Pupil Holding Power in Selected School Districts" (Unpublished Ed.D. dissertation, Teachers College, Columbia University, 1969).

Many recent studies, influenced no doubt by pressures on the educational system to develop students intellectually, have relied on achievement (and what is claimed by some to be virtually the same thing, intelligence) tests as a qualitative measure of school and pupil performance. For example, the aforementioned Benson, Burkhead, Coleman, Husen, Raymond and Martin studies have employed one or another measure of achievement or intelligence as their dependent variable. In a society such as our own which generally rewards high scholastic achievement with increased social and economic status, the paper-pencil achievement test probably represents the best single criterion of educational success so far developed. Yet it is not without its faults--which include its unidimensionality (most educators would argue that the development of the intellect is but one function of the school) and the theoretical and empirical difficulties of separating students' innate abilities from their achievement on culture-bound tests.

The school drop-out rate, or more popularly, its reverse, termed school "holding power," has served as a quantitative criterion of school performance in several studies. The holding power criterion assumes however, that completion of thirteen years of formal schooling is necessarily a good thing--an idea that has not yet reached universal consensus. (Friedenberg, for example sees compulsory attendance laws--which certainly enhance holding power rates--as a violation of civil liberty and has written that "a large proportion of the drop-outs may be doing what is best for themselves under the atrocious circumstances that exist."[26]) Other pupil performance measures employed in the aforementioned studies have included students' attendance rates in post-high school education, post-high school employment, and student success in college.

Finally, school performance has been measured at the point of the educational process itself. Researchers in the Institute of Administrative Research, for example, are presently experimenting with an instrument which assumes that the excellent formal educational process will be typified by a relative abundance of four qualities: individualization of instructional procedures; interpersonal regard among pupils and between pupils and teachers; creative expression and divergent thinking on the part of students; and well-integrated group activities.[27] This humanistic definition of school quality gets around certain of the theoretical and statistical problems of the pupil performance criteria yet there is not empirical assurance that instructional processes displaying the four "Indicators of Quality" have the power to cause discernable change in pupil performance.

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[26]Edgar Z. Friedenberg, "An Ideology of School Withdrawal," Commentary XXXV (June, 1963), 493.

[27]Vincent, "Indicators of Quality," op.cit.

The problem of definition, in short, is one of settling on what our educational processes should consist of or be producing--and on this matter we have not yet reached accord. Should the schools be raising students' scores on achievement tests, holding their pupils until graduation, or ensuring that their instructional processes are functioning in harmony with the wishes of some educational experts? Or should school-men be concerned with developing "leadership" and "creativity," getting their students into college, getting their students into "good" colleges, or "good" jobs, fostering "equality of educational opportunity," or operating economically? It is obvious that our schools cannot simultaneously do all that might be asked of them. Perhaps the best eventual research definition of school performance will be similar to those being worked on by the initiators of Pennsylvania's assessment program: multidimensional and longitudinal measurement of student behaviors and skills.[28]

The Definition and Measurement of Correlates

A second, related problem facing those who would infer the causes of school performance is that of adequately defining and measuring its correlates. A number of studies have been faulted for failure to include important input variables. The Coleman survey, for example, has been adjudged deficient because it did not adequately measure school resource levels and did not adequately describe the range of important school facilities (for example, there was no measure of class size among the variables Coleman related to student achievement).[29] Some other studies have been unable to assess the effect of instructional staff characteristics on pupil outcomes except through the use of proxy measures such as teacher salary averages. Benson, for example, concluded "that caliber of teachers is the single most important [in-school] factor"[30] in predicting achievement. His measures of "teacher caliber," however, were salary and certification variables.

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[28]See, for example: Paul B. Campbell and others, "Phase I Findings: Educational Quality Assessment" (Harrisburg, Pa: Pennsylvania Department of Public Instruction, 1968). (Mimeographed.) or Educational Testing Service, A Plan for Evaluating the Quality of Educational Programs in Pennsylvania: Highlights of a Report from Educational Testing Service to the State Board of Education of the Commonwealth of Pennsylvania (Princeton, N.J.: Educational Testing Service, 1965).

[29]Samuel Bowles and Henry M. Levin, "The Determinants of Scholastic Achievement--An Appraisal of Some Recent Evidence," The Journal of Human Resources, III (Winter, 1968), 8-12. For similar criticisms of the Coleman survey see: Eric A. Hanushek and John F. Kain, On the Value of Equality of Educational Opportunity as A Guide to Public Policy (Discussion Paper Number 36. Cambridge, Mass.: Program on Regional and Urban Economics, Harvard University, 1969).

[30]Benson, op.cit.

Problems of Meaningful Association of Variables

To the knotty problems of theoretically and empirically defining and measuring the many data categories and variables that make up an educational "system" must be added a third and equally formidable one--that of statistically associating the variables in a meaningful manner. There are too many variables affecting school performance for researchers to experimentally control and manipulate them all at once (though this is not to suggest that experimental research has no place in the search for the causes of pupil behaviors). Thus, researchers have had to rely on survey-type correlation analyses and infer from them the causes of variation in educational success.

The basic research problem, hence, is to attribute variation in school performance (dependent variables) to variation in educational inputs (independent or explanatory variables). Presently-developed statistical techniques unfortunately, have not been completely adequate to the task. The determination of causation in correlational analysis is a sophisticated and usually unsatisfactorily-resolved problem. Additionally, it is next-to-impossible to statistically disentangle the sequential and generally overlapping effects of a large number of independent variables on a dependent one. Thus, a number of writers have criticized the studies here under discussion for their multiple regression techniques. Bowles and Levin, for example, have written of the Coleman Study that:

> When the explanatory variables . . . are highly correlated with each other, as are the background characteristics of students and the characteristics of the schools they attend, the addition to the proportion of variance in achievement that each will explain is dependent on the order in which each is entered into the regression equation. By being related to each other . . . [the background characteristics of students and background characteristics of schools] share a certain amount of explanatory power which is common to both of them.[31]

The statistical problem, in short, is to assign unique explanatory power for school performance to the input factors portrayed in Figure I and to order them in importance. It is an issue that has not yet been satisfactorily resolved.

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[31]Bowles and Levin, op.cit., 15. See also: Hanushek and Kain, op.cit. For a more technical discussion of this problem see: Robert A. Gordon, "Issues in Multiple Regression," The American Journal of Sociology, LXXIII (March, 1968), 592-616 and Charles E. Wertz and Robert L. Linn, "Analyzing School Effects: How to Use the Same Data to Support Different Hypotheses," American Educational Research Journal, VI (May, 1969), 439-447.

Other Problems

Two other problems of much of the research into the correlates of school performance deserve special mention: The inability (generally) to obtain school-by-school data rather than district-wide averages, and the failure to obtain longitudinal data on pupils. It has been shown, first, that variation among schools within districts may be as great or greater than that between districts.[32] Thus, these differences are obscured when system-wide averages are employed. Second, the lack of longitudinal data makes it difficult to assay the long-term effects of school on students.[33]

Finally, to the limitations outlined above must be added the small but nevertheless irritatingly real problems that seem to plague educational research--indeed, all social science research: small, incomplete, non-random samples, lack of resources and personnel (which often results in over-reliance on graduate students for much critical work); and a spirit of non-cooperation or apathy on the part of some local educational agencies.

A REVIEW OF THE FINDINGS

What purpose, then, has the research paradigm described above served? Despite its limitations we may note at least four contributions to the search for knowledge concerning our educational systems.

The Importance of Non-School Variables to Educational Performance

First, much to the chagrin of some professional educators, the research has clearly demonstrated that the independent variables bearing the strongest relationships to pupil performance variables are of a non-school nature. Many educators in the decades before the computer--along with much research--had over-emphasized schools as arbiters of pupil performance. Coleman's oft-quoted statement, however, is typical of the conclusions of several studies: "When these factors [representing students' socio-economic background] are statistically controlled . . . it appears that differences between schools account for only a small fraction of differences in pupil achievement."[34]

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[32]See, for example, Burkhead and others; op.cit.; and Patricia Cayo Sexton, Education and Income: Inequalities in Our Public Schools (New York: Viking Press, 1964).

[33]This problem is discussed in relation to the Coleman survey by Bowles and Levin, op.cit., 14-15; and Hanushek and Kain, op.cit., 36-38 and 43-44.

[34]Coleman and others, op.cit., 21-22.

This conclusion, coming as it finally did from such a massive and powerfully-backed survey, has in fact done a great deal to propel a new educational proposition to the fore: that schools (at least insofar as they are presently organized and operated) don't have much impact on student performance and the best (if not the only) way, therefore, to raise achievement levels of disadvantaged children is to place them in a more stimulating peer group relationship. Translated into operational terms the proposition calls for the socio-economic and racial integration of great numbers of urban and suburban school children.

The Importance of School Variables to Educational Success

A second major finding of the surveys under discussion is that qualities of schools are not totally irrelevant to educational success. One set of in-school variables--that representing qualities of the instructional staff--has shown a consistent (though small) unique relationship with criteria of pupil performance in several studies. Again the Coleman survey, which employed a more comprehensive set of staff variables than most other research, is instructive: "Altogether," wrote Coleman, "variation in school averages of teachers' characteristics accounted for higher proportion of variation in school achievement than did all other aspects of the school combined, excluding the student body characteristics."[35] Coleman further stated that the apparent effect of staff characteristics was related to what he termed the "sensitivity" of a group of children to the school's environment. Thus, he suggested that "the effect of good teachers is greatest upon the children who suffer the most educational disadvantage in their background, and that a given investment in up-grading teacher quality will have the most effect on achievement in under-privileged areas."[36] Additionally, it would appear from the survey's data that "the effect of teachers' characteristics shows a sharp increase over the years of school."[37] Coleman's research on the instructional staff suggests, in short, that: (1) aggregated characteristics of the instructional staff are related to pupil achievement (there is no intention of here implying that qualities of the aggregated staff shown important to average measures of educational success are universally important to individual teaching success); (2) the relationship is more pronounced with disadvantaged than advantaged students; and (3) staff qualities make a greater difference to student learning the longer students are associated with them. The first of these suggestions is supported by the other major studies mentioned; the second is supported by the Benson survey;[38] and the third has not been considered by the other research under discussion.

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[35] Ibid., 316.

[36] Ibid., 317.

[37] Ibid.

[38] Benson and others, op.cit., 58.

As was discussed above, it is entirely likely that past research has somewhat underestimated the relationships between staff characteristics and educational performance variables. Thus, we may be reasonably sure that the level of educational success of children will be a partial function of the kind of professional staff with which they are provided. In Coleman's analysis important staff characteristics included teachers' family education level (positive effect on students), teachers' own education (positive effect), and teachers' score on a paper-pencil vocabulary test.[39]

The Importance of Money

A third conclusion that may be at least tentatively drawn from research employing the input-process-output model is that "money makes a difference." This is so if only because the quality of a school system's instructional staff appears to be related to that system's expenditure. Coleman has written that there is no significant relationship between school-system expenditure level and teachers' characteristics except in Southern schools attended by Negroes.[40] Levin, however, has attacked this conclusion. He has written that the multiple relationship between salaries and characteristics shows that "most of the variance in teachers' salaries is . . . accounted for by . . . teachers' characteristics . . ."[41] Wilbur's study of the relationship between staff characteristics and per-pupil expenditure in sixty-eight school systems provides additional evidence of a relationship.[42] On balance, the evidence is that more "qualified" teachers tend toward school systems that pay them well. (Although it is possible that some "disadvantaged" schools especially some of those in the great cities, are beginning to receive substantial benefits from idealistic young college graduates who--in an upset of the teaching profession's economic model--would rather work where the need is than where the money is.)

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[39]Coleman and others, op.cit., 317-318, Weinfeld, Mayeske, and Beaton factor analyzed Coleman's staff questionnaire and developed eight empirically meaningful groupings of variables for both elementary and secondary teachers. They were labelled: experience, teaching conditions, localism of background, socio-economic background, training, college attended, teaching related activities, and preferences for student ability level. See: Frederic D. Weinfeld, George W. Mayeske, and Albert E. Beaton, Jr. "Correlational and Factorial Analysis of Items from the Educational Opportunities Survey Teacher Questionnaire" (Washington, D.C.: National Center for Educational Statistics, 1967). (Mimeographed.)

[40]James S. Coleman in a letter to the editor, Saturday Review, LI (February 17, 1969), 50.

[41]Henry M. Levin in a letter to the editor, ibid.

[42]Thomas P. Wilbur, "Relationship Between Certain Staff Characteristics and Measures of Holding Power and Expenditure." IAR Research Bulletin, VIII (February), 7-11.

The Complexity of the Educational "System"

Finally, and perhaps most importantly, the input-process-output research model (together with many other lines of educational research) has disabused us of any notions we might have once had that the formal and informal educational processes were simple ones. The several inter-related non-school research variables listed above acting in concert with their likewise inter-related in-school variables, bear a complex relationship to what this monograph has termed school performance. If the research efforts here discussed have not catalogued a set of administratively manipulable determinates of school quality--and they have not--they have at least helped to make us aware of the complex and inter-related nature of the school, its children and surrounding environment.

This more complex and inter-related conceptualization of the educational process offers insight into the solution of the most vexing educational issue presently facing us, namely the equalization of educational opportunity. Two different kinds of solutions--each based partly on one or another of the first three conclusions listed above--have been advanced: (1) a large-scale infusion of resources into schools that serve disadvantaged children; and (2) socio-economic and racial integration of the schools. The first would raise the educational performance of poor children through improved instruction; the second through the mediation of peer group influences. The fourth conclusion resulting from the input-process-output research provides arguments for a synthesis, however: that the solution to the low school performance levels of disadvantaged children will be an excellent school system operating within an integrated and healthy social milieu. Indeed, this is the argument presently favored by most educators--despite presently unfavorable demographic and school-finance trends.

SUMMARY

This monograph has: (1) presented the major conclusion of a number of studies designed to explore the correlates of school performance; (2) discussed several important limitations of those studies; and (3) outlined major conclusions that may be drawn from them.

In summary, the input-process-output research model--together with other lines of educational investigation--has helped us to understand four things about our formal schooling processes: (1) they are fundamentally influenced by the children who participate in them and the environment in which they operate; (2) they are additionally influenced by the levels at which they are supported; (3) the effects of resources are largely mediated through the professional staff; and (4) they operate in complex, inter-related, and arcane fashion.

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